

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	1916	((light adj emitting adj diode) laser) and gan	USPAT; US-PGP; UB; EPO; 2001/07/17 JPO; 13:32 DERWEN T; IBM TDB	
2	BRS	L2	175	1 and ni and au	USPAT; US-PGP; UB; EPO; 2001/07/17 JPO; 13:30 DERWEN T; IBM TDB	
3	BRS	L3	17	2 and ((heat adj treat) anneal)	USPAT; US-PGP; UB; EPO; 2001/07/17 JPO; 13:31 DERWEN T; IBM TDB	
4	BRS	L4	2027	((light adj emitting adj (diode diodes)) (laser lasers)) and gan	USPAT; US-PGP; UB; EPO; 2001/07/17 JPO; 13:33 DERWEN T; IBM TDB	
5	BRS	L5	179	4 and ni and au	USPAT; US-PGP; UB; EPO; 2001/07/17 JPO; 13:33 DERWEN T; IBM TDB	

	Type	L #	Hits	Search Text	DBs	Time Stamp
6	BRS	L6	115	5 and ((heat adj treat\$4) anneal\$4)	USPAT; US-PGP UB; EPO; JPO; DERWEN T; IBM TDB	2001/07/17 13:35
7	BRS	L7	48	6 and @ay<1997	USPAT; US-PGP UB; EPO; JPO; DERWEN T; IBM TDB	2001/07/17 13:36

Set Items Description

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05772607 Genuine Article#: WX008 Number of References: 6
Title: UV, blue and green light emitting diodes based on GaN-InGaN
multiple quantum wells over sapphire and (111) spinel substrates
Author(s): Khan MA (REPRINT) ; Chen Q; Yang J; Sun CJ; Lim B; Temkin H;
Schetzina J; Shur MS
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Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences; CC
ENGI--Current Contents, Engineering, Computing & Technology
Journal Subject Category: MATERIALS SCIENCE; PHYSICS, CONDENSED MATTER
Abstract: Recently Nakamura et al. have reported on high brightness visible
LEDs based on **AlGaN** -InGaN multiple quantum wells (MQWs) using
atmospheric pressure metal-organic chemical vapor deposition (MOCVD)
and **AlGaN** barrier layers around an $In_xGa_{1-x}N$ - $In_yGa_{1-y}N$ multiple
quantum well region. We now report the fabrication of high brightness
vertical cavity UV, blue and green light emitting diodes using low
pressure MOCVD with **GaN** - $In_xGa_{1-x}N$ multiple quantum wells surrounded
by **GaN** barrier layers. Our device structures over sapphire and cubic
(111) spinel substrates consisted of a 10 period **GaN** -InGaN MQW (25
Angstrom well-50 Angstrom barrier) surrounded by n- and p-**GaN** layers.
Structures with both Mg-doped and undoped quantum wells (active
regions) were deposited. Mesa type LED structures were then fabricated
using Ti-Al and **Ni -Au** for the n- and p-ohmic contacts. Light
emission was observed in a vertical cavity geometry from the sapphire
or the spinel substrate side. For 250 mm diameter mesa devices the
series resistances ranged from 10 to 25 Omega. These are some of the
lowest reported values. Spectral emission linewidths (FWHM) of 12, 25
and 40 nm were obtained respectively for the UV, blue, and green MQW
LEDs. These linewidths are similar to those of Nakamura et al. We also
report on optically pumped MQW InGaN-**GaN** lasers with different
quantum well thicknesses. In these devices, we observed the quantum
shift related to the subband energy dependence on the well thickness
and estimated the effective conduction band discontinuity at the **GaN**
-InGaN heterointerface from these data.
Descriptors--Author Keywords: **light emitting diode** ; **GaN -InGaN laser**
; multiple quantum wells ; metal-organic chemical vapor deposition
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King, D.J.; Zhang, L.; Ramer, J.C.; Rice, A.; Malloy, K.J.; Hersee, S.D.; Leste Wood, M.

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